CENTERS FOR DISEASE CONTROL

August 7, 1987 / Vol. 36 / No. 30

MMWR

MORBIDITY AND MORTALITY WEEKLY REPORT

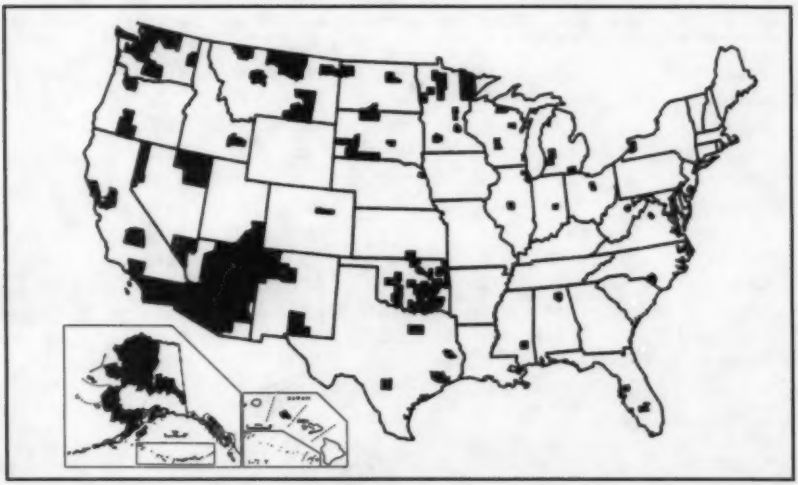
Topics in Minority Health

Tuberculosis Among American Indians and Alaskan Natives — United States, 1985

In 1985, 22,201 cases of tuberculosis were reported to CDC, for an incidence rate of 9.3 cases per 100,000 U.S. population (*1*). Three hundred and ninety-seven (2%) of the 22,170 patients with known race were American Indians and Alaskan Natives. The incidence rate for this group was 25.0/100,000 population, 4.4 times the rate of 5.7/100,000 for the white population (*2*).

The 397 tuberculosis cases among American Indians and Alaskan Natives were reported from 144 (5%) of the nation's 3,138 counties (Figure 1). Three hundred and eighty-five (97%) of these cases were reported from the 32 states with reservations

FIGURE 1. Counties reporting tuberculosis cases among American Indians and Alaskan Natives — United States, 1985



U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES / PUBLIC HEALTH SERVICE

Tuberculosis — Continued

(Table 1). Eleven of these states reported 326 (82%) of these 385 cases. In these 11 states, the ratio of the incidence of tuberculosis among American Indians and Alaskan Natives to the incidence among all other races ranged from 4.2 in Oklahoma to 30.4 in South Dakota and 31.4 in Minnesota. American Indians and Alaskan Natives accounted for large proportions of reported tuberculosis cases in Alaska and South Dakota (71% and 62%, respectively); however, they only comprise 14% of the Alaskan population and 7% of the South Dakota population.

The median age of American Indians and Alaskan Natives with tuberculosis was 45 years. One hundred and thirty-eight (35%) of the 397 patients were less than 35 years of age.

Reported by: Div of Tuberculosis Control, Center for Prevention Svcs, CDC.

Editorial Note: Paleopathological evidence has demonstrated the existence of tuberculosis in the Americas in pre-Columbian times (*3*). However, the high rates of morbidity and mortality from tuberculosis observed among American Indians at the end of the last century have been attributed to increased contact with the white civilization (*4*). This is also believed to be the case in Alaska, where the morbidity rates from tuberculosis in the early 1950s were the highest ever reported in the medical literature (*5*). Active case-finding, treatment, and extensive use of preventive chemotherapy in the 1950s and 1960s markedly reduced tuberculosis mortality and morbidity in Alaska (*6*). However, the incidence rate of tuberculosis among Alaskan

TABLE 1. Tuberculosis cases and rates* among American Indians and Alaskan Natives (AI/AN) and other races, by states with highest rates — United States, 1985

State	Total†		AI/AN		Other than AI/AN		Proportion AI/AN (%)	Rate Ratio AI/AN:Other
	No.	(Rate)	No.	(Rate)	No.	(Rate)		
Reservation								
Alaska	110	(21.1)	68	(92.2)	42	(9.4)	(61.8)	9.8
Minnesota	142	(3.4)	33	(81.6)	109	(2.6)	(23.2)	31.4
Montana	49	(5.9)	21	(47.2)	28	(3.6)	(42.9)	13.1
South Dakota	31	(4.4)	22	(42.6)	9	(1.4)	(71.0)	30.4
Arizona	271	(8.5)	59	(33.7)	212	(7.0)	(21.8)	4.8
Washington	220	(5.0)	21	(31.0)	199	(4.6)	(9.5)	6.7
Oklahoma	264	(8.0)	54	(28.4)	210	(6.8)	(20.5)	4.2
Nevada	39	(4.2)	5	(28.1)	34	(3.7)	(12.8)	7.6
Wisconsin	141	(3.0)	9	(27.4)	132	(2.8)	(6.4)	9.8
Oregon	144	(5.4)	8	(26.5)	136	(5.1)	(5.6)	5.2
New Mexico	94	(6.5)	26	(22.3)	68	(5.1)	(27.7)	4.4
Other (21)	13,104	(10.1)	59	(9.7)	13,045	(10.1)	(0.5)	1.0
Subtotal	14,609	(9.3)	385	(26.5)	14,224	(9.2)	(2.6)	2.9
Non-Reservation (18) and District of Columbia	7,561	(9.2)	12	(9.0)	7,549	(9.2)	(0.2)	1.0
Total	**22,170**	**(9.3)**	**397**	**(25.0)**	**21,773**	**(9.2)**	**(1.8)**	**2.7**

*Per 100,000 population.

†31 cases among persons of unknown race were excluded from the total 22,201 cases.

Tuberculosis – Continued

Natives in 1985 was still 10-fold higher than the national average. In some states, the risk of tuberculosis was up to 30-fold higher among American Indians than among other races.

Because tuberculosis among American Indians and Alaskan Natives is concentrated in well-defined geographic pockets, intensive use of preventive measures may be particularly effective. In 1985, 35% of American Indians and Alaskan Natives with tuberculosis were under 35 years of age, the age group for which preventive therapy is routinely recommended for infected persons with no additional risk factors (*7*). Directly observed therapy and incentives for compliance should also decrease morbidity.

In addition, the prevalence of diabetes mellitus, which is a recognized risk factor for tuberculosis, has increased among most American Indian and Alaskan Native populations during the past 50 years and now ranges up to 50% (*8*). Preventive chemotherapy is recommended for patients with diabetes who are infected with the tubercle bacillus, regardless of their age (*7*). Tuberculin skin testing is recommended for all young adult American Indians and Alaskan Natives as well as for diabetics of any age. Preventive therapy should be administered according to the current guidelines (*7*).

Intentional isoniazid overdosage has been reported among American Indians (*9*), as it has among other populations (*10*). Thus, physicians should be familiar with treatment of isoniazid toxicity (*11*). Because of the risk of overdosage with self-administered therapy, directly observed therapy should be used for persons with a history of depression or suicidal tendencies.

References

1. CDC. Tuberculosis—United States, 1985. MMWR 1986;35:699-703.
2. CDC. Tuberculosis in minorities—United States. MMWR 1987;36:77-80.
3. Buikstra JE, ed. Prehistoric tuberculosis in the Americas. Evanston, Illinois: Northwestern University Archaeological Program, 1981.
4. Matthews W. Consumption among the Indians. NY Med J 1887;45:1-3.
5. Comstock GW, Philip RN. Decline of the tuberculosis epidemic in Alaska. Public Health Rep 1961;76:19-24.
6. Johnson MW. Results of 20 years of tuberculosis control in Alaska. Health Serv Rep 1973;88:247-54.
7. American Thoracic Society, CDC. Treatment of tuberculosis and tuberculosis infection in adults and children. Am Rev Respir Dis 1986;134:355-63.
8. Sievers ML, Fisher JR. Diabetes in North American Indians. In: Diabetes in America. Bethesda, Maryland: US Department of Health and Human Services, Public Health Service, National Institutes of Health, 1985:chapter XI, 1-19; DHHS publication no. (NIH)85-1468.
9. Sievers ML, Cynamon MH, Bittker TE. Intentional isoniazid overdosage among southwestern American Indians. Am J Psychiatry 1975;132:662-5.
10. Blanchard PD, Yao JDC, McAlpine DE, Hurt RD. Isoniazid overdose in the Cambodian population of Olmsted County, Minnesota. JAMA 1986;256:3131-3.
11. Sievers ML, Herrier RN. Treatment of acute isoniazid toxicity. Am J Hosp Pharm 1975;32:202-6.

Epidemiologic Notes and Reports

Mumps Outbreaks on University Campuses — Illinois, Wisconsin, South Dakota

A total of 480 cases of mumps (epidemic parotitis) were reported among students attending 16 universities and colleges in three states where active surveillance was undertaken during the 1986-87 academic year. This report summarizes the investigations of these outbreaks.

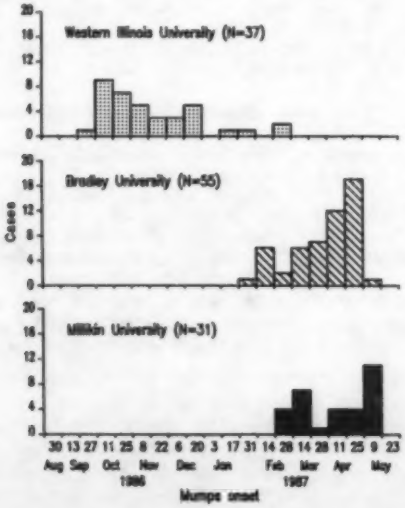
Illinois

One hundred and eighty-three cases of clinically diagnosed mumps* were reported from 10 colleges and universities in Illinois during the 1986-87 school year. Detailed investigations, including interviews with patients, were conducted for three of these outbreaks, which totaled 123 cases. Four cases were serologically confirmed at the state laboratory by a fourfold or greater rise in hemagglutination inhibition antibody titer of sera taken during the acute and convalescent stages of illness.

Western Illinois University, Macomb: From September 17, 1986, to February 25, 1987, 37 cases of parotitis were identified at Western Illinois University (WIU), which has a full-time undergraduate student enrollment of 8,912 (Figure 1). The attack rate among males (5.9/1,000) was 2.7 times higher than the attack rate among females (2.2/1,000) (95% confidence interval [CI] = 1.3, 5.5). In addition, the attack rate among

*A clinical case of mumps was one diagnosed by either a physician or a nurse and including a report of painful swelling of the jaw lasting at least 2 days.

FIGURE 1. Reported cases of mumps among college and university students, by biweekly intervals of onset — Illinois, September 1986-May 1987



Mumps — Continued

students living in on-campus residence halls (6.5/1,000) was 8 times the attack rate among those in other forms of housing (0.8/1,000) (CI = 3.0, 21.6). Of the 36 patients for whom school class was known, attack rates were inversely related to the class level. These rates were 7.0/1,000 for freshmen, 4.2/1,000 for sophomores, 1.6/1,000 for juniors, and 1.5/1,000 for seniors (chi-square for trend, $p < 0.001$). A similar trend was observed for the subset of students living in dormitory housing ($p < 0.03$).

Bradley University, Peoria: From January 22 to May 3, 1987, 55 cases of mumps were reported from Bradley University, which has a full-time undergraduate student enrollment of 3,328 (Figure 1). Interview data were available on 45 students. The attack rate among males (17.6/1,000) was not significantly different from the attack rate among females (15.1/1,000). The attack rate for dormitory residents was 18.8/1,000; for fraternity and sorority residents, it was 12.8/1,000; and for residents of other off-campus housing, it was 14.8/1,000. As at WIU, underclasspersons were the most likely to be affected, with rates of 18.5/1,000 for freshmen and 25.0/1,000 for sophomores, compared with rates of 10.0/1,000 for juniors and 9.3/1,000 for seniors ($p < 0.006$).

Millikin University, Decatur: From February 18 to May 15, 1987, 31 cases were reported from Millikin University, which has a full-time undergraduate student enrollment of 1,377 (Figure 1). Interview data were available for 20 ill students. The attack rates among males (20.6/1,000) and females (24.1/1,000) were not significantly different. In-state residents, who comprised 92% of the enrollment, had an attack rate of 11.0/1,000. The attack rate among out-of-state residents was 54.5/1,000 (relative risk = 4.9; CI = 2.1, 11.6). Residence-specific attack rates were 21.8/1,000 for dormitory residents, 11.2/1,000 for fraternity and sorority residents, and 5.3/1,000 for residents of other off-campus housing ($p = 0.06$). Freshmen had the highest risk of mumps, with an attack rate of 39.0/1,000, compared with 11.3/1,000 for sophomores and 5.8/1,000 for juniors ($p = 0.001$). No cases were reported among seniors.

In the three Illinois university outbreaks, students missed an average of 6.5 days of classes. The 102 ill students who were interviewed at least 2 weeks after onset of parotitis averaged 2.3 health-care visits each. This included visits to emergency rooms and private physicians, but not hospitalizations. Six students were hospitalized for a total of 32 days, an average of 5 days each. Seventeen percent of the 102 patients reported severe headache, often associated with other meningeal signs and symptoms. Nineteen percent (12) of the 64 male patients reported orchitis, as evidenced by testicular pain and swelling. Three of these patients required hospitalization.

Control efforts at each of the universities focused on isolating ill students from the rest of the student body. This was usually accomplished by sending students to their parents' homes. Publicity about the outbreaks was disseminated through university publications and health services. Students who were uncertain of their immunity to mumps were encouraged to obtain mumps vaccine. WIU provided combined measles-mumps-rubella vaccine for a nominal fee and gave 46 doses over the course of the outbreak. Bradley University provided single antigen mumps vaccine free of charge and gave 152 doses. Millikin University directed students to the nearby county health department to receive vaccine, but none took advantage of the opportunity. By the end of the school year, however, Millikin University had established a policy requiring proof of immunity to mumps for matriculation in the fall of 1987. The Illinois legislature has recently mandated that both public and private colleges and universities require all students to present proof of protection against mumps as well as five

Mumps – Continued

other vaccine-preventable diseases. Proof of immunity to mumps can consist of documentation of either physician-diagnosed mumps or vaccination with live mumps vaccine at 12 months of age or older.

South Dakota

A total of 119 cases of mumps was reported from five universities and colleges in South Dakota during the 1986-87 school year. The University of South Dakota at Vermillion, which has a full-time student enrollment of 5,511, reported 94 cases. A 22-year-old Iowa woman with onset of illness on December 18, 1986, had the first reported case. The last reported case occurred on May 1, 1987, 1 week prior to the end of classes for the academic year. Although follow-up study to determine complications was not complete, epididymo-orchitis was reported for three (5%) of the 56 affected males. No other complications were reported. Forty-four (47%) of the 94 students lacked documentation of either prior mumps vaccination or previous mumps illness. Comparison data for students who did not become ill were not available.

(Continued on page 503)

TABLE I. Summary – cases specified notifiable diseases, United States

Disease	30th Week Ending			Cumulative, 30th Week Ending		
	August 1, 1987	July 26, 1986	Median 1982-1986	August 1, 1987	July 26, 1986	Median 1982-1986
Acquired Immunodeficiency Syndrome (AIDS)	330	300	N	10,518	7,084	N
Aseptic meningitis	446	424	300	4,175	3,651	3,217
Encephalitis: Primary (arthropod-borne & unspec)	30	36	34	543	512	567
Post-infectious	1	4	1	68	67	67
Gonorrhea: Civilian	12,640	20,794	19,870	445,507	494,088	495,299
Military	361	382	474	9,415	9,436	12,111
Hepatitis: Type A	429	447	415	14,146	12,544	12,243
Type B	478	572	456	14,822	14,783	14,284
Non A, Non B	62	69	N	1,799	2,066	N
Unspecified	69	85	99	1,822	2,657	3,242
Legionellosis	19	18	N	472	344	N
Leprosy	4	9	2	111	170	146
Malaria	26	35	29	448	553	537
Measles: Total*	76	163	36	3,002	4,827	2,098
Indigenous	64	159	N	2,678	4,577	N
Imported	12	4	N	324	244	N
Meningococcal infections: Total	48	39	38	1,893	1,655	1,826
Civilian	48	39	38	1,892	1,653	1,811
Military	-	-	-	1	2	6
Mumps	60	227	36	9,721	2,97[illegible]	2,277
Pertussis	72	48	48	1,070	1,565	1,190
Rubella (German measles)	19	30	27	263	377	473
Syphilis (Primary & Secondary): Civilian	754	629	629	19,573	14,757	15,935
Military	2	4	8	91	104	203
Toxic Shock syndrome	5	9	N	169	206	N
Tuberculosis	383	557	511	11,823	12,211	12,211
Tularemia	11	10	10	103	67	128
Typhoid Fever	6	5	10	169	158	191
Typhus fever, tick-borne (RMSF)	31	43	43	348	395	465
Rabies, animal	51	54	126	2,781	3,178	3,178

TABLE II. Notifiable diseases of low frequency, United States

	Cum. 1987		Cum. 1987
Anthrax	-	Leptospirosis (Mo. 1)	13
Botulism: Foodborne	4	Plague	3
Infant (Calif. 2)	35	Poliomyelitis, Paralytic	-
Other	-	Psittacosis (Colo. 1, Calif. 3)	57
Brucellosis (Fla. 2)	63	Rabies, human	-
Cholera	-	Tetanus (Ill. 1, Mo. 1)	21
Congenital rubella syndrome	3	Trichinosis (Calif. 1)	28
Congenital syphilis, ages < 1 year	-	Typhus fever, flea-borne (endemic, murine)	17
Diphtheria	1		

*Two of the 76 reported cases for this week were imported from a foreign country or can be directly traceable to a known internationally imported case within two generations.

TABLE III. Cases of specified notifiable diseases, United States, weeks ending August 1, 1987 and July 26, 1986 (30th Week)

Reporting Area	AIDS	Aseptic Meningitis	Encephalitis		Gonorrhea (Civilian)		Hepatitis(Viral), by type				Legionellosis	Leprosy
			Primary	Post-infectious			A	B	NA,NB	Unspecified		
	Cum. 1987	1987	Cum. 1987	Cum. 1987	Cum. 1987	Cum. 1986	1987	1987	1987	1987	1987	Cum. 1987
UNITED STATES	10,618	446	543	68	446,507	494,088	429	478	62	69	19	111
NEW ENGLAND	426	29	25	2	13,955	11,269	20	24	3	6	-	10
Maine	15	1	1	-	394	519	-	2	-	1	-	-
N.H.	12	2	1	-	229	297	-	-	-	-	-	2
Vt.	4	5	4	-	123	158	-	1	-	-	-	-
Mass.	250	3	12	1	5,014	4,831	8	21	3	5	-	7
R.I.	39	11	3	1	1,189	971	-	-	-	-	-	-
Conn.	107	7	4	-	7,006	4,493	12	-	-	-	-	1
MID. ATLANTIC	2,920	67	72	5	72,258	83,143	12	68	3	14	2	5
Upstate N.Y.	397	24	31	3	9,680	9,649	1	1	2	-	2	-
N.Y. City	1,660	7	5	-	37,909	48,292	5	48	-	14	-	5
N.J.	540	26	7	-	9,273	10,572	3	7	-	-	-	-
Pa.	323	10	29	2	15,396	13,630	3	12	1	-	-	-
E.N. CENTRAL	698	112	163	12	65,091	69,069	32	41	1	4	4	4
Ohio	112	41	60	5	14,476	16,671	4	9	-	-	2	1
Ind.	57	19	19	-	5,148	6,802	5	10	-	1	-	-
Ill.	348	2	23	7	20,196	18,266	-	-	1	-	1	1
Mich.	125	50	49	-	19,770	20,283	23	22	-	3	1	1
Wis.	56	-	12	-	5,501	7,047	-	-	-	-	-	1
W.N. CENTRAL	225	20	22	-	17,989	21,410	34	29	6	4	2	-
Minn.	60	2	13	-	2,844	2,975	-	-	-	-	1	-
Iowa	15	3	3	-	1,766	2,100	-	2	2	2	1	-
Mo.	104	12	-	-	9,365	10,966	10	23	3	2	-	-
N. Dak.	1	-	-	-	150	189	-	-	-	-	-	-
S. Dak.	2	1	-	-	330	436	-	-	-	-	-	-
Nebr.	14	-	4	-	1,159	1,536	17	3	-	-	-	-
Kans.	29	2	2	-	2,374	3,206	7	1	1	-	-	-
S. ATLANTIC	1,739	58	63	19	116,902	126,482	32	92	6	6	5	5
Del.	10	4	3	1	1,982	1,998	3	4	1	-	-	-
Md.	192	4	10	4	13,330	14,690	-	7	2	-	1	2
D.C.	231	2	-	-	7,930	9,410	2	2	-	-	-	-
Va.	125	-	22	2	8,632	10,323	-	-	-	-	-	-
W. Va.	14	5	9	-	869	1,299	1	2	-	1	-	-
N.C.	87	9	9	-	17,415	19,916	3	13	1	2	2	-
S.C.	42	-	-	-	9,689	11,191	1	12	1	-	-	1
Ga.	267	5	-	-	19,705	21,822	3	22	-	-	2	-
Fla.	771	30	10	12	37,470	35,833	19	30	1	2	-	2
E.S. CENTRAL	127	24	30	6	33,853	39,811	6	23	2	-	1	-
Ky.	22	8	14	1	3,438	4,436	2	4	-	-	-	-
Tenn.	15	3	7	-	11,752	15,367	2	13	1	-	1	-
Ala.	76	13	9	1	10,928	11,416	1	5	1	-	-	-
Miss.	14	-	-	4	7,735	8,602	1	1	-	-	-	-
W.S. CENTRAL	1,061	45	57	4	50,499	59,104	31	31	4	10	1	4
Ark.	22	-	-	2	5,676	5,488	-	-	-	-	-	-
La.	134	-	6	-	9,036	10,475	-	-	-	-	-	-
Okla.	51	12	12	1	5,607	6,641	6	3	1	2	-	-
Tex.	854	33	39	1	30,180	36,500	25	28	3	8	1	4
MOUNTAIN	277	13	13	3	11,865	14,454	67	35	8	6	-	1
Mont.	2	-	-	-	314	411	7	1	-	-	-	-
Idaho	4	-	-	-	433	485	1	-	-	-	-	-
Wyo.	3	-	-	-	261	336	-	-	-	-	-	-
Colo.	115	7	1	-	2,571	3,792	6	4	3	3	-	-
N. Mex.	15	2	1	-	1,311	1,463	2	6	1	-	-	-
Ariz.	88	3	9	1	4,105	4,875	44	21	4	3	-	-
Utah	18	1	-	2	370	622	3	1	-	-	-	-
Nev.	34	-	2	-	2,500	2,671	4	2	-	-	-	1
PACIFIC	3,045	77	96	17	64,096	69,346	195	135	29	20	4	82
Wash.	140	-	9	3	4,563	5,379	31	23	10	-	4	3
Oreg.	71	-	-	-	2,397	2,741	22	12	2	-	-	-
Calif.	2,776	73	86	14	55,633	58,824	140	97	16	18	-	64
Alaska	8	2	2	-	987	1,626	1	1	1	-	-	-
Hawaii	50	2	2	-	526	776	1	2	-	2	-	15
Guam	-	-	-	-	131	101	-	-	-	-	-	-
P.R.	73	-	1	1	1,232	1,323	-	3	-	-	-	5
V.I.	-	-	-	-	148	138	-	-	-	-	-	-
Pac. Trust Terr.	-	-	-	-	270	224	1	-	-	5	-	44
Amer. Samoa	-	-	-	-	47	30	-	1	-	10	-	-

N: Not notifiable U: Unavailable

TABLE III. (Cont'd.) Cases of specified notifiable diseases, United States, weeks ending August 1, 1987 and July 26, 1986 (30th Week)

Reporting Area	Malaria	Measles (Rubeola)					Menin-gococcal infections	Mumps		Pertussis			Rubella		
		Indigenous		Imported*		Total									
	Cum. 1987	1987	Cum. 1987	1987	Cum. 1987	Cum. 1986	Cum. 1987	1987	Cum. 1987	1987	Cum. 1987	Cum. 1986	1987	Cum. 1987	Cum. 1986
UNITED STATES	448	64	2,678	12	324	4,827	1,893	60	9,721	72	1,070	1,585	19	263	377
NEW ENGLAND	31	-	100	-	150	83	162	-	29	15	50	105	-	1	9
Maine	-	-	3	-	-	10	10	-	-	-	5	2	-	1	-
N.H.	1	-	51	-	102	41	17	-	8	-	4	54	-	-	1
Vt.	-	-	10	-	14	-	10	-	2	-	4	3	-	-	1
Mass.	11	-	21	-	27	28	78	-	5	15	24	27	-	-	4
R.I.	6	-	1	-	1	2	14	-	2	-	1	3	-	-	2
Conn.	13	-	14	-	6	2	33	-	12	-	12	16	-	-	1
MID. ATLANTIC	42	10	484	2	48	1,426	230	1	156	10	136	116	-	11	30
Upstate N.Y.	17	1	25	1†	11	62	60	-	75	5	100	77	-	9	22
N.Y. City	4	9	415	1†	15	437	19	-	-	-	-	3	-	1	5
N.J.	11	-	23	-	3	905	46	-	39	-	6	9	-	1	3
Pa.	10	-	21	-	17	22	85	1	42	5	30	27	-	-	-
E.N. CENTRAL	20	2	277	4	22	977	270	21	5,664	4	111	233	2	30	55
Ohio	8	-	1	-	4	10	58	-	77	-	35	82	-	-	-
Ind.	4	-	-	-	-	11	32	17	822	2	6	22	-	-	-
Ill.	1	2	108	4§	16	620	63	2	2,431	-	5	26	2	22	48
Mich.	7	-	29	-	-	48	72	2	839	2	30	23	-	8	6
Wis.	-	-	139	-	2	283	15	-	1,495	-	35	78	-	-	1
W.N. CENTRAL	15	1	108	-	22	284	84	17	1,278	4	65	98	-	1	10
Minn.	5	-	16	-	20	48	25	12	748	-	10	33	-	-	-
Iowa	3	-	-	-	-	79	3	1	371	-	15	11	-	1	1
Mo.	4	1	182	-	1	31	22	1	21	3	22	5	-	-	1
N. Dak.	-	-	-	-	-	25	1	-	6	-	3	3	-	-	1
S. Dak.	-	-	-	-	-	-	2	3	85	1	3	13	-	-	-
Nebr.	2	-	-	-	-	1	4	-	3	-	1	3	-	-	-
Kans.	1	-	-	-	1	99	27	-	44	-	11	20	-	-	7
S. ATLANTIC	74	6	101	-	10	572	313	3	223	8	196	563	-	13	4
Del.	1	1	32	-	-	1	4	-	-	2	2	222	-	2	-
Md.	18	1	3	-	2	25	29	-	21	-	5	155	-	2	-
D.C.	8	-	-	-	1	1	5	-	1	-	-	-	-	-	-
Va.	14	-	1	-	-	57	52	-	66	-	38	20	-	1	-
W. Va.	2	-	-	-	-	2	1	1	29	1	41	10	-	-	-
N.C.	9	1	2	-	2	3	42	2	16	4	79	30	-	1	-
S.C.	3	2	2	-	-	301	32	-	12	-	-	11	-	-	-
Ga.	3	-	-	-	1	89	60	-	40	-	17	80	-	1	-
Fla.	16	1	61	-	4	89	88	-	38	1	14	35	-	6	4
E.S. CENTRAL	8	-	2	-	-	61	88	3	1,214	-	22	26	-	3	2
Ky.	1	-	-	-	-	3	15	2	212	-	1	2	-	2	2
Tenn.	1	-	-	-	-	55	33	1	946	-	6	7	-	1	-
Ala.	1	-	-	-	-	1	33	-	56	-	10	17	-	-	-
Miss.	5	-	2	-	-	2	7	N	N	-	5	-	-	-	-
W.S. CENTRAL	30	7	318	-	3	610	127	-	700	7	93	103	5	10	55
Ark.	1	-	-	-	-	283	17	-	278	-	7	7	-	2	-
La.	-	-	-	-	-	4	10	-	203	-	17	6	-	-	-
Okla.	4	1	2	-	1	36	17	N	N	7	69	62	5	5	-
Tex.	25	6	316	-	2	287	83	-	219	-	-	28	-	3	55
MOUNTAIN	20	4	463	4	19	309	66	1	181	9	104	149	3	22	20
Mont.	-	4	133	-	1	7	3	-	4	1	5	7	3	6	2
Idaho	2	-	-	-	-	1	5	-	3	-	28	31	-	1	-
Wyo.	1	-	-	-	2	-	-	-	-	-	5	1	-	1	-
Colo.	8	-	5	4§	4	7	20	-	28	8	35	41	-	-	1
N. Mex.	1	-	297	-	9	34	3	N	N	-	7	16	-	-	-
Ariz.	8	-	28	-	1	253	22	1	135	-	23	30	-	4	2
Utah	-	-	-	-	1	6	9	-	8	-	1	20	-	10	12
Nev.	2	-	2	-	1	1	4	-	3	-	-	3	-	-	3
PACIFIC	208	34	735	2	52	506	553	14	276	15	293	162	9	172	192
Wash.	15	2	33	2§	3	147	67	1	39	5	49	61	1	1	11
Oreg.	5	26	28	-	33	7	25	N	N	-	14	9	1	2	1
Calif.	184	6	674	-	12	331	448	13	216	2	115	105	7	168	178
Alaska	3	-	-	-	-	-	4	-	6	1	4	2	-	2	-
Hawaii	1	-	-	-	4	20	9	-	13	7	111	5	-	59	4
Guam	-	-	2	-	-	5	4	-	5	-	-	-	-	1	2
P.R.	1	47	705	-	-	33	5	-	8	1	13	9	-	2	58
V.I.	-	-	-	-	-	-	-	-	9	-	-	-	-	-	-
Pac. Trust Terr.	-	-	1	-	-	-	1	-	5	-	1	-	-	1	1
Amer. Samoa	-	-	-	-	-	2	-	-	3	-	-	-	-	-	1

*For measles only, imported cases includes both out-of-state and international importations.
N: Not notifiable U: Unavailable †International §Out-of-state

TABLE III. (Cont'd.) Cases of specified notifiable diseases, United States, weeks ending August 1, 1987 and July 26, 1986 (30th Week)

Reporting Area	Syphilis (Civilian) (Primary& Secondary)		Toxic-shock Syndrome	Tuberculosis		Tula-remia	Typhoid Fever	Typhus Fever (Tick-borne) (RMSF)	Rabies, Animal
	Cum. 1987	Cum. 1986	1987	Cum. 1987	Cum. 1986	Cum. 1987	Cum. 1987	Cum. 1987	Cum. 1987
UNITED STATES	19,573	14,757	5	11,823	12,211	103	169	348	2,781
NEW ENGLAND	323	288	2	372	375	-	18	4	5
Maine	1	15	1	17	30	-	1	-	2
N.H.	3	10	-	8	11	-	-	-	-
Vt.	1	6	-	8	12	-	1	-	-
Mass.	157	152	-	204	181	-	11	2	-
R.I.	8	16	1	30	27	-	2	-	1
Conn.	153	89	-	105	114	-	3	2	2
MID. ATLANTIC	3,641	2,091	-	2,060	2,484	-	20	8	213
Upstate N.Y.	122	98	-	310	364	-	7	6	22
N.Y. City	2,823	1,188	-	997	1,299	-	1	-	-
N.J.	397	367	-	372	430	-	12	1	9
Pa.	499	418	-	371	391	-	-	1	182
E.N. CENTRAL	527	600	1	1,430	1,445	1	20	33	94
Ohio	67	76	-	265	245	1	6	27	7
Ind.	36	67	-	136	155	-	4	-	12
Ill.	286	329	-	608	642	-	7	1	31
Mich.	96	98	1	359	334	-	2	4	14
Wis.	42	29	-	62	69	-	1	1	30
W.N. CENTRAL	80	139	-	369	349	30	9	46	634
Minn.	12	24	-	76	89	-	4	-	158
Iowa	12	6	-	24	28	3	2	-	175
Mo.	46	75	-	202	173	18	3	18	36
N. Dak.	-	4	-	5	8	-	-	-	83
S. Dak.	8	2	-	21	16	5	-	1	136
Nebr.	7	11	-	15	6	1	-	1	16
Kans.	4	17	-	26	32	2	-	26	31
S. ATLANTIC	6,729	4,427	-	2,534	2,334	5	13	120	743
Del.	47	31	-	26	26	1	-	1	-
Md.	349	254	-	227	170	-	3	33	244
D.C.	193	180	-	80	79	-	-	-	32
Va.	174	219	-	298	192	2	1	6	232
W. Va.	6	13	-	67	69	-	1	5	32
N.C.	373	301	-	261	318	1	1	35	5
S.C.	461	393	-	247	302	-	-	26	34
Ga.	891	869	-	403	364	-	-	13	114
Fla.	4,235	2,167	-	955	824	1	7	1	50
E.S. CENTRAL	1,097	1,012	-	942	1,070	4	2	45	201
Ky.	10	47	-	241	253	1	1	5	102
Tenn.	448	367	-	224	312	1	1	30	51
Ala.	274	316	-	306	340	-	-	8	48
Miss.	365	282	-	172	165	2	-	2	-
W.S. CENTRAL	2,477	3,039	1	1,383	1,885	43	9	80	413
Ark.	156	155	-	162	202	22	1	10	82
La.	432	513	-	144	298	3	-	-	11
Okla.	91	84	-	139	148	18	2	63	23
Tex.	1,798	2,287	1	938	969	-	6	7	297
MOUNTAIN	412	345	1	279	280	10	9	10	220
Mont.	8	6	-	9	14	1	-	8	108
Idaho	4	7	-	17	11	1	-	-	3
Wyo.	1	-	-	-	-	-	-	1	45
Colo.	66	66	-	29	30	2	-	-	6
N. Mex.	36	45	-	51	58	1	8	-	1
Ariz.	201	144	1	141	130	3	1	-	47
Utah	15	9	-	16	20	1	-	1	4
Nev.	81	48	-	16	17	1	-	-	6
PACIFIC	4,278	2,816	-	2,464	2,269	10	69	2	258
Wash.	73	99	-	153	115	4	5	-	-
Oreg.	151	83	-	62	78	3	1	-	-
Calif.	4,042	2,632	-	2,096	1,948	2	60	2	255
Alaska	3	-	-	34	33	1	-	-	3
Hawaii	9	22	-	119	117	-	3	-	-
Guam	2	1	-	25	32	-	-	-	-
P.R.	585	469	-	183	165	-	-	-	41
V.I.	3	-	-	2	1	-	-	-	-
Pac. Trust Terr.	116	164	-	113	35	-	16	-	-
Amer. Samoa	2	-	-	-	3	-	1	-	-

U: Unavailable

TABLE IV. Deaths in 121 U.S. cities,* week ending August 1, 1987 (30th Week)

Reporting Area	All Causes, By Age (Years)						P&I**
	All Ages	>65	45-64	25-44	1-24	<1	Total
NEW ENGLAND	685	490	114	45	21	15	53
Boston, Mass.	183	115	42	14	4	8	19
Bridgeport, Conn.	48	36	7	1	4	-	1
Cambridge, Mass.	36	29	5	1	1	-	10
Fall River, Mass.	18	17	1	-	-	-	-
Hartford, Conn.	72	45	11	10	3	3	4
Lowell, Mass.	22	19	2	1	-	-	2
Lynn, Mass.	12	10	2	-	-	-	-
New Bedford, Mass.	22	18	3	-	1	-	-
New Haven, Conn.	68	48	12	6	2	-	2
Providence, R.I.	50	33	11	4	1	1	1
Somerville, Mass.	4	3	1	-	-	-	-
Springfield, Mass.	55	43	7	3	1	1	7
Waterbury, Conn.	40	30	4	2	2	2	3
Worcester, Mass.	55	44	6	3	2	-	4
MID. ATLANTIC	2,861	1,906	596	304	80	74	133
Albany, N.Y.	89	54	8	4	1	2	1
Allentown, Pa.	11	5	4	2	-	-	-
Buffalo, N.Y.	106	67	27	4	2	6	10
Camden, N.J.	43	29	10	3	-	1	3
Elizabeth, N.J.	21	12	7	2	-	-	1
Erie, Pa.†	41	29	7	2	1	2	1
Jersey City, N.J.	65	35	19	7	1	3	4
N.Y. City, N.Y.	1,511	907	320	216	40	28	57
Newark, N.J.	82	39	14	15	6	7	1
Paterson, N.J.	21	13	5	1	2	-	-
Philadelphia, Pa.	393	260	87	24	11	11	18
Pittsburgh, Pa.†	86	56	18	7	-	5	-
Reading, Pa.	37	30	7	-	-	-	6
Rochester, N.Y.	114	80	22	2	10	-	15
Schenectady, N.Y.	32	21	7	3	1	-	3
Scranton, Pa.†	33	21	8	2	2	-	2
Syracuse, N.Y.	90	66	9	6	2	7	2
Trenton, N.J.	47	29	14	2	1	1	1
Utica, N.Y.	28	27	1	-	-	-	5
Yonkers, N.Y.	31	26	2	2	-	1	3
E.N. CENTRAL	2,413	1,524	559	165	68	97	75
Akron, Ohio	83	55	16	5	2	5	2
Canton, Ohio	30	16	4	-	-	-	4
Chicago, Ill.§	564	362	125	45	10	22	16
Cincinnati, Ohio	158	100	34	6	4	14	13
Cleveland, Ohio	170	118	33	5	1	13	-
Columbus, Ohio	171	98	37	18	8	10	2
Dayton, Ohio	100	64	26	6	1	3	2
Detroit, Mich.	274	137	71	37	17	12	5
Evansville, Ind.	48	33	11	2	2	-	2
Fort Wayne, Ind.	62	42	16	2	1	1	3
Gary, Ind.	21	9	8	3	1	-	-
Grand Rapids, Mich.	67	46	12	4	2	1	9
Indianapolis, Ind.	176	101	50	13	6	6	1
Madison, Wis.	24	17	4	1	2	-	1
Milwaukee, Wis.	156	109	39	5	-	3	2
Peoria, Ill.	46	32	12	2	-	-	2
Rockford, Ill.	43	31	7	2	2	1	2
South Bend, Ind.	47	33	12	-	-	2	2
Toledo, Ohio	106	67	25	5	7	2	6
Youngstown, Ohio	77	52	17	4	2	2	1
W.N. CENTRAL	852	564	172	61	21	34	52
Des Moines, Iowa	68	44	13	5	3	3	4
Duluth, Minn.	30	19	7	2	1	1	1
Kansas City, Kans.	36	19	13	4	-	-	1
Kansas City, Mo.	120	77	23	12	2	6	4
Lincoln, Nebr.	40	31	3	4	1	1	3
Minneapolis, Minn.	183	131	31	9	4	8	17
Omaha, Nebr.	89	62	23	3	-	1	4
St. Louis, Mo.	151	86	34	14	8	9	17
St. Paul, Minn.	54	44	8	1	-	1	1
Wichita, Kans.	81	51	17	7	2	4	-
S. ATLANTIC	1,432	792	297	222	67	52	70
Atlanta, Ga.	124	75	35	8	6	-	2
Baltimore, Md.	280	176	54	30	14	6	14
Charlotte, N.C.	81	41	25	8	4	3	3
Jacksonville, Fla.	140	90	23	11	10	6	3
Miami, Fla.	138	76	30	24	2	6	1
Norfolk, Va.	46	19	18	3	5	1	6
Richmond, Va.	81	44	23	10	2	2	11
Savannah, Ga.	49	41	3	1	2	2	2
St. Petersburg, Fla.	80	67	7	3	1	2	4
Tampa, Fla.	61	36	12	7	-	5	6
Washington, D.C.	332	116	65	111	20	19	18
Wilmington, Del.	20	11	2	6	1	-	-
E.S. CENTRAL	725	441	174	63	24	23	36
Birmingham, Ala.	114	62	22	16	7	7	-
Chattanooga, Tenn.	61	38	14	5	4	-	6
Knoxville, Tenn.	72	46	17	5	2	2	4
Louisville, Ky.	84	52	24	8	-	-	4
Memphis, Tenn.	189	102	41	11	5	10	13
Mobile, Ala.	71	44	19	6	1	1	7
Montgomery, Ala.	33	23	7	2	-	1	-
Nashville, Tenn.	121	74	30	10	5	2	2
W.S. CENTRAL	1,283	782	277	117	56	51	60
Austin, Tex.	66	42	12	10	1	1	6
Baton Rouge, La.	49	31	9	5	2	2	1
Corpus Christi, Tex.	52	33	13	1	3	2	1
Dallas, Tex.	180	97	38	28	7	10	6
El Paso, Tex.	49	33	9	4	3	-	2
Fort Worth, Tex	89	52	23	7	3	4	6
Houston, Tex.§	308	176	74	34	13	11	7
Little Rock, Ark.	67	46	15	3	1	2	8
New Orleans, La.	74	46	21	1	4	3	-
San Antonio, Tex.	187	121	29	16	14	7	13
Shreveport, La.	60	39	14	2	2	3	5
Tulsa, Okla.	102	67	20	6	3	6	5
MOUNTAIN	644	380	130	70	33	30	38
Albuquerque, N. Mex.	90	50	21	5	10	3	5
Colo. Springs, Colo.	44	28	5	4	7	-	10
Denver, Colo.	96	56	22	9	4	5	3
Las Vegas, Nev.	100	55	22	17	-	6	3
Ogden, Utah	23	18	2	2	1	-	4
Phoenix, Ariz.	135	73	29	18	6	9	3
Pueblo, Colo.	28	20	6	1	1	-	1
Salt Lake City, Utah	37	16	8	6	3	4	-
Tucson, Ariz.	91	64	15	8	1	3	9
PACIFIC	1,980	1,300	381	175	64	54	92
Berkeley, Calif.	20	13	4	2	-	1	1
Fresno, Calif.	63	38	12	5	1	7	7
Glendale, Calif.	33	26	5	2	-	-	4
Honolulu, Hawaii	68	53	7	6	1	1	7
Long Beach, Calif.	113	70	24	11	2	6	5
Los Angeles Calif.	564	370	115	56	13	5	15
Oakland, Calif.	108	67	24	8	5	4	6
Pasadena, Calif.	43	31	7	3	2	-	2
Portland, Oreg.	167	115	28	13	6	5	6
Sacramento, Calif.	117	71	26	10	6	4	5
San Diego, Calif.	166	103	34	11	8	9	14
San Francisco, Calif.	128	79	23	18	4	3	4
San Jose, Calif.	155	98	30	18	9	-	10
Seattle, Wash.	128	85	25	9	4	5	-
Spokane, Wash.	64	51	8	1	3	1	4
Tacoma, Wash.	44	30	9	2	-	3	2
TOTAL	12,875††	8,079	2,700	1,222	434	430	609

*Mortality data in this table are voluntarily reported from 121 cities in the United states, most of which have populations of 100,000 or more. A death is reported by the place of its occurrence and by the week that the death certificate was filed. Fetal deaths are not included.

**Pneumonia and influenza.

†Because of changes in reporting methods in these 3 Pennsylvania cities, these numbers are partial counts for the current week. Complete counts will be available in 4 to 6 weeks.

††Total includes unknown ages.

§Data not available. Figures are estimates based on average of past 4 weeks.

Mumps — Continued

Mumps was also reported from four other colleges and universities in South Dakota: South Dakota State University (SDSU) in Brookings (16 cases), Northern State College (five cases), Augustana College (three cases), and Sioux Falls College (one case). Complications were reported for two (12.5%) of the 16 affected students at SDSU. One was a female student with meningoencephalitis and pancreatitis; the other, a male student with epididymo-orchitis. Neither student had a history of receiving mumps vaccine. No complications were reported from the remaining three colleges reporting mumps cases.

Wisconsin

The largest outbreak occurred at Marquette University in Milwaukee, where 178 cases of mumps were reported between February 4 and May 14, 1987. The university has about 8,700 full-time undergraduate students, 50% of whom are from out-of-state. The outbreak peaked in April but continued into June. Mumps virus was isolated from 15 patients. One hundred (60%) of the 168 patients for whom data on gender were available were male. The median age was 20 years. Although there was no systematic assessment of complications, physicians at the student health service were aware of at least six cases (6%) of orchitis among affected males. These physicians were not aware of any students who developed meningoencephalitis or required hospitalization. The outbreak was publicized through university and local news media. Measles-mumps-rubella vaccine was offered to students through the student health service free of charge, and 239 doses were administered during the outbreak.

Reported by: K Caspall, McDonough County Health Dept; C Jennings, W Moran, M Andreasen, D Yeagle, R March, Immunization Program, BJ Francis, MD, State Epidemiologist, Illinois Dept of Public Health. L Schaefer, G Rhyne, Immunization Program, KA Senger, State Epidemiologist, South Dakota State Dept of Health. H Nichamin, MD, Milwaukee City Health Dept; C Leutzinger, Immunization Program, JP Davis, MD, State Epidemiologist, Wisconsin Dept of Health & Social Svcs. Div of Field Svcs, Epidemiology Program Office; Div of Immunization, Center for Prevention Svcs, CDC.

Editorial Note: In general, the epidemiologic findings reported in the Illinois investigations were in keeping with observations in similar settings where there are aggregations of children and young adults in close contact. These settings include military barracks, boarding schools, and other institutions. Males and females are generally affected with equal frequency. Since preliminary data do not suggest any difference by gender in rates of mumps vaccination, the difference in attack rates for males and females at WIU was probably due to unknown differences by gender in the likelihood of exposure to mumps virus at this university. At WIU, residence in a dormitory was found to be a risk factor, presumably because of the increased potential for exposure to mumps virus in a dormitory setting. This increased potential could be due either to more confined living conditions or simply to close contact with greater numbers of contagious persons. The reason for the higher attack rates in freshmen and sophomores as compared with juniors and seniors is as yet unresolved. This observation may reflect differences in exposure or differences in rates of susceptibility to mumps by class level.

In 1986, after 15 years of nearly continuous decline in the reported incidence of mumps in the United States, there was an increase in cases reported to CDC (*1,2*). The national incidence was higher than in any of the preceding 5 years. The 1986 rate, however, was still 96% lower than the reported incidence in 1968, the first full year

Mumps — Continued

that mumps vaccine was available. More than 9,000 cases of mumps have already been reported in the first 6 months of 1987, a fourfold increase over the comparable period in 1986.

Available data suggest that the increase in mumps activity has been largely a result of illness among unvaccinated middle and high school students (*1,2*). Survey data and records of vaccine administration from selected states, including Illinois, demonstrate a substantial lag in mumps vaccine uptake in persons 10 years of age and older, compared with the uptake of measles vaccine until 1985 (CDC, unpublished data). This pattern is in keeping with the history of immunization policy in the United States. Although mumps vaccine was licensed in December 1967, the higher cost and lower priority of the vaccine compared with either measles or rubella vaccine limited its initial use[†]. It was not until 1977 that the Immunization Practices Advisory Committee (ACIP) first began to recommend routine use of mumps vaccine for all susceptible children 12 months of age or older (*3*). A more aggressive approach to the vaccination of susceptible older children and young adults was not advocated until 1980 (*4*).

With the gradual accumulation and increasing age of this pool of susceptible persons, outbreaks could be anticipated to extend beyond secondary schools into colleges and perhaps into the workplace. The outbreaks reported here show this to be more than a theoretical possibility. The fact that mumps attack rates were substantially high, regardless of state of residence, suggests that the potential for outbreaks is an especially important consideration for those states that now have populations of college students who were not previously covered by laws requiring mumps vaccination for entry into school.

Historically, less attention has been given to mumps prevention because of the perception that mumps illness is mild and does not warrant special efforts directed at those not reached by the use of measles-mumps-rubella vaccine or by laws requiring mumps vaccination for entry into school. This has been particularly true if such efforts would have been at the expense of other ongoing public health programs. In addition to the evident educational and economic costs documented in the three Illinois outbreaks, the frequency of complications reported from these outbreaks (the only ones for which complete follow-up study was conducted) was in keeping with previous studies. Epididymo-orchitis occurs among 20%-30% of post-pubertal males with clinical cases. Central nervous system involvement is another common manifestation of mumps. Approximately 60% of patients with clinical cases of mumps will have a pleocytosis in the cerebrospinal fluid, while 10% will have clinically symptomatic meningoencephalitis, characterized by headache and neck stiffness. Although apparently not a factor in these outbreaks, mumps virus infection during the first trimester of pregnancy has been associated with increased fetal mortality. In the pre-vaccine era, mumps was also one of the leading causes of acquired unilateral neurosensory deafness in children (*5*).

While a recent outbreak investigation suggests that mumps vaccination efforts during an outbreak may contribute to the termination of the outbreak (*6*), control measures available to contain a mumps outbreak are limited in scope and not of proven value. Primary prevention by routinely vaccinating susceptible children and adults is a more desirable approach. To assess mumps vaccine effectiveness, efforts

[†]The mumps component makes up slightly more than one-half the cost of the measles-mumps-rubella vaccine.

Mumps — Continued

are underway to obtain provider-verified vaccination records on cases and controls in the three outbreaks at Illinois universities. Prior studies have shown the currently available mumps vaccine to be safe, effective, and cost-effective in the prevention of mumps illness (*7-9*). Reported clinical vaccine efficacies have ranged from 75% to 90% (*9-13*). Similar experience with measles outbreaks has shown it to be more cost-effective to prevent outbreaks than to attempt to control them (*14*).

The American College Health Association recommends requiring that all students born after 1956 present documentation of vaccination against mumps and five other vaccine-preventable diseases before matriculation (*15*). The ACIP has made a similar recommendation for vaccination of susceptible adolescents and young adults (*7*). In light of this cluster of outbreaks of mumps illness on university campuses, colleges and universities in the United States should consider implementing and enforcing such policies for all vaccine-preventable diseases.

References

1. CDC. Mumps—United States, 1985-1986. MMWR 1987;36:151-5.
2. Cochi SL, Preblud SR. Current status of mumps in the United States. In: Proceedings of the 21st Immunization Conference. New Orleans, Louisiana: 21st Immunization Conference, 1987 (in press).
3. ACIP. Mumps vaccine. MMWR 1977;26:393-4.
4. ACIP. Mumps vaccine. MMWR 1980;29:87-8,93-4.
5. CDC. Mumps surveillance, January 1977-December 1982. Atlanta, Georgia: US Department of Health and Human Services, Public Health Service, 1984.
6. Wharton M, Bistowish JM, Hutcheson RH, Schaffner W. Mumps in a high school—Tennessee [Abstract]. Atlanta, Georgia: Epidemic Intelligence Service 36th Annual Conference, CDC, 1987.
7. ACIP. Mumps vaccine. MMWR 1982;31:617-20, 625.
8. Koplan JP, Preblud SR. A benefit-cost analysis of mumps vaccine. Am J Dis Child 1982;136: 362-4.
9. Chaiken BP, Williams NM, Preblud SR, Parkin W, Altman R. The effect of a school entry law on mumps activity in a school district. JAMA 1987;257:2455-8.
10. CDC. Mumps in an elementary school—New York. MMWR 1973;22:185-6.
11. Lewis JE, Chernesky MA, Rawls ML, Rawls WE. Epidemic of mumps in a partially immune population. Can Med Assoc J 1979;121:751-4.
12. Sullivan KM, Halpin TJ, Marks JS, Kim-Farley R. Effectiveness of mumps vaccine in a school outbreak. Am J Dis Child 1985;139:909-12.
13. Kim-Farley R, Bart S, Stetler H, et al. Clinical mumps vaccine efficacy. Am J Epidemiol 1985;121:593-7.
14. CDC. Measles outbreaks on university campuses—Indiana, Ohio, Texas. MMWR 1983;32: 193-5.
15. American College Health Association. Position statement on immunization policy. J Am Coll Health 1983;32:7-8.

Progress in Chronic Disease Prevention

Reduction of Children's Arsenic Exposure Following Relocation — Mill Creek, Montana

Soil in the communities surrounding Anaconda, Montana, remains contaminated with arsenic, even though the copper smelter located there has been closed since 1980. Because of concern that children might be exposed to arsenic by hand-to-

Arsenic Exposure — Continued

mouth activity, those who lived near the smelter and were between 2 and 6 years of age were tested for urinary arsenic in March and again in July 1985.

Children living in the small community of Mill Creek, which had the highest levels of arsenic in soil, had elevated levels of urinary arsenic at both testings. Their mean level of urinary arsenic was 66.0 μg/l in March and 54.1 μg/l in July. (In the control community of Livingston, Montana, mean levels of urinary arsenic were 10.6 μg/l in March and 16.6 μg/l in July.) Since a level of 50 μg/l has been considered indicative of excess exposure in the past (*1*), additional urine samples were obtained between July and November 1985. The children's levels of urinary arsenic remained elevated. In the summer of 1986, the U.S. Environmental Protection Agency temporarily relocated 10 Mill Creek families until a permanent solution to the problem could be developed.

To evaluate the effect of relocation on levels of urinary arsenic, urine samples were obtained from as many members of the families being relocated as possible. Each individual was asked to supply a total of six urine samples taken upon waking up in the morning. Three were to be taken in July, before relocation, and three, afterward, in October. Levels of urinary arsenic were measured using atomic absorption spectrophotometry. The average pre- and post-move concentrations of urinary arsenic were calculated for each person. These averages were used to calculate group averages.

Forty-one persons provided at least one urine sample. Four of these people did not move from Mill Creek. Thirty-two of the 37 people who were relocated provided samples both before and after relocation. The average pre-move level of urinary arsenic for the 6 relocated children who were <8 years of age was 76.0 μg/l; their average post-move level was 15.3μg/l. The average pre-move level for persons ≥8 years of age was 17.2 μg/l; their average post-move level was 14.6 μg/l. Although five individuals had levels of urinary arsenic >50 μg/l prior to the move, none had levels >50 μg/l after relocation from Mill Creek.

Reported by: JK Gedrose, MN, State Epidemiologist, Montana State Dept of Health and Environmental Sciences. Div of Environmental Hazards and Health Effects, Center for Environmental Health, CDC.

Editorial Note: Arsenic is believed to be potently carcinogenic, both through ingestion and through inhalation. About 70% of a daily dose of arsenic, which has a half-life of 10-30 hours, is eliminated in the urine in a biphasic manner (*2*). Levels of urinary arsenic are generally considered the best indicators of exposure to arsenic occurring within the few days preceding testing (*3*).

Mean levels of urinary arsenic among Mill Creek residents decreased after relocation. However, relocation is a controversial strategy for reducing exposure to environmental contaminants. A decision about the long-term management of the contamination in Mill Creek has not yet been reached.

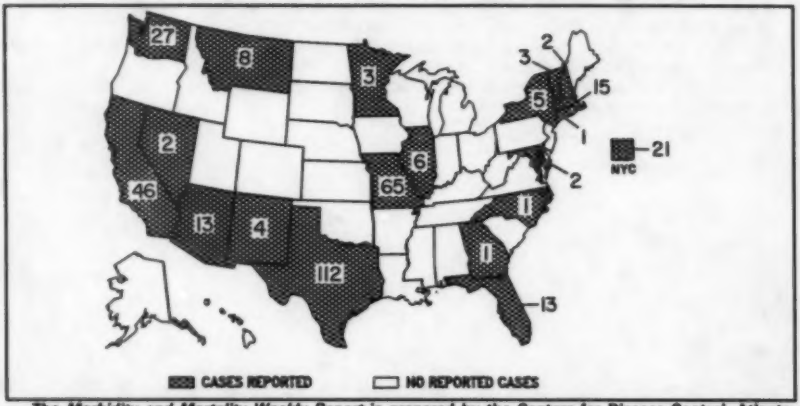
The finding that children's pre-move levels of urinary arsenic were so much greater than the levels of adults is consistent with the hypothesis that the children were being exposed to arsenic through ingestion of soil. As with lead poisoning, hand-to-mouth activity is believed to be the primary route of exposure. The results of testing in Mill Creek indicate that children can serve as a sentinel population for nonoccupational exposure to environmental hazards when the primary pathway is through soil ingestion.

Arsenic Exposure — Continued

References

1. Landrigan PJ. Arsenic. In: Rom WN, ed. Environmental and occupational medicine. Boston, Massachusetts: Little, Brown and Company, 1983:473-9.
2. Crecelius EA. Changes in chemical speciation of arsenic after ingestion by man. Environ Health Perspect 1977;19:147-50.
3. Lauwerys RR. Industrial chemical exposure: guidelines for biological monitoring. Davis, California: Biomedical Publications, 1983.

FIGURE I. Reported measles cases — United States, weeks 26-29, 1987



The *Morbidity and Mortality Weekly Report* is prepared by the Centers for Disease Control, Atlanta, Georgia, and available on a paid subscription basis from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402, (202) 783-3238.

The data in this report are provisional, based on weekly reports to CDC by state health departments. The reporting week concludes at close of business on Friday; compiled data on a national basis are officially released to the public on the succeeding Friday. The editor welcomes accounts of interesting cases, outbreaks, environmental hazards, or other public health problems of current interest to health officials. Such reports and any other matters pertaining to editorial or other textual considerations should be addressed to: Editor, *Morbidity and Mortality Weekly Report*, Centers for Disease Control, Atlanta, Georgia 30333.

Director, Centers for Disease Control
James O. Mason, M.D., Dr.P.H.

Director, Epidemiology Program Office
Carl W. Tyler, Jr., M.D.

Editor
Michael B. Gregg, M.D.

Managing Editor
Gwendolyn A. Ingraham

☆U.S. Government Printing Office: 1987-730-145/60018 Region IV

HHS Publication No. (CDC) 87-8017